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Operable Unit 3-13, Group 3, Site CPP-03 Field Sampling Plan

October 2005

Idaho Cleanup Project

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Prepared for the
U.S. Department of Energy
DOE Idaho Operations Office

ABSTRACT

This Field Sampling Plan describes the Operable Unit 3-13, Group 3, Site CPP-03 field sampling activities to be performed at the Idaho Nuclear Technology and Engineering Center located within the Idaho National Laboratory Site. Sampling activities described in this plan provide additional characterization data for the support of the remedial action objectives and remediation goals presented in the Final Record of Decision, Idaho Nuclear Technology and Engineering Center, Operable Unit 3-13.

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ACRONYMS

AA	alternative action
AL	action level
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
COC	contaminant of concern
CV	coefficient of variance
DEQ	Department of Environmental Quality (Idaho)
DOE	Department of Energy
DOE-ID	Department of Energy Idaho Operations Office
DOT	Department of Transportation
DQA	data quality assessment
DQO	data quality objective
DS	decision statement
EPA	Environmental Protection Agency
FFA/CO	Federal Facility Agreement and Consent Order
FSP	field sampling plan
FTL	field team leader
GPR	ground-penetrating radar
HASP	health and safety plan
HPGe	high-purity germanium
ICP	Idaho Cleanup Project
ID	identification
IEDMS	Integrated Environmental Data Management System
INL	Idaho National Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
MDA	minimum detectable activity

MDL	method detection limit
OU	operable unit
PPE	personal protective equipment
PSQ	principal study question
QA	quality assurance
QAPjP	Quality Assurance Project Plan
QC	quality control
RCT	radiological control technician
RD/RA	remedial design/remedial action
RG	remediation goal
ROD	Record of Decision
SAM	sample and analysis management
SAP	sampling and analysis plan
WAG	waste area group

Operable Unit 3-13, Group 3, Site CPP-03 Field Sampling Plan

1. INTRODUCTION

In accordance with the *Federal Facility Agreement and Consent Order for the Idaho National Engineering Laboratory* (FFA/CO) (DOE-ID 1991), the U.S. Department of Energy (DOE) submits the following Field Sampling Plan (FSP) for the Idaho Cleanup Project (ICP), Operable Unit (OU) 3-13, Group 3, Site CPP-03. This FSP provides guidance for the collection of samples needed to support the remediation of the Other Surface Soils Remediation Sets 1–3, Site CPP-03.

This FSP is implemented with the latest revision of the *Quality Assurance Project Plan for Waste Area Groups 1, 2, 3, 4, 5, 6, 7, 10 and Deactivation, Decontamination, and Decommissioning* (QAPjP) (DOE-ID 2004a), which provides guidance for sampling, quality assurance (QA), quality control (QC), analytical procedures, and data management. Together, the QAPjP and this FSP constitute the remedial action sampling and analysis plan (SAP). The QAPjP describes the objectives and QA/QC protocols that will achieve the specified data quality objectives (DQOs). Use of this FSP will help ensure that data are scientifically valid, defensible, and of known and acceptable quality; while use of the QAPjP will ensure that the data generated are suitable for their intended purposes.

The QAPjP and this FSP have been prepared pursuant to the *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (EPA 1988), the FFA/CO, and company policies and procedures.

1.1 Field Sampling Plan Objectives

The overall objective of this FSP is to guide the collection and analyses of sample data for additional characterization of OU 3-13, Group 3, Other Surface Soils, Site CPP-03. The Record of Decision (ROD) -selected remedy for the remedial action of Site CPP-03 includes excavating the soils found to be above the remediation goals (RGs), disposing of them appropriately, performing confirmation sampling, and backfilling the excavation with clean fill.

The data obtained during this investigation will be used to determine the lateral extent and depths of excavations required within Site CPP-03 to meet the RGs.

Based on the DQOs developed in Section 3.1 of this plan, this FSP will support additional characterization and post-remediation sampling to confirm that the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) ROD-defined, RGs have been met to ensure protection of human health and the environment relative to concentrations of contaminants found previously at Site CPP-03. Table 1-1 identifies the risk-based remediation goals for OU 3-13 soils and compares those values to sampling data from Site CPP-03. The principal threat posed by the Group 3 sites is external exposure to contaminated soils, with Cs-137 being identified in the OU 3-13 ROD (DOE-ID 1999) as the primary contaminant of concern (COC) for CPP-03. The selected remedy for the Group 3 sites will eliminate this threat by removing the contaminated soils found to be above RGs as identified in Section 5.3.3.9 of the OU 3-13 ROD (DOE-ID 1999).

Table 1-1. Risk-based remediation goals for Operable Unit 3-13 soils and sample comparison.

Contaminant of Concern	Soil Risk-Based Remediation Goal for Single COCs (pCi/g)	Number of Samples Collected in Track 2 Investigation[a]	Highest Concentration	Lowest Concentration	Number of Samples above RGs
Cs-137	23 pCi/L	9	65.1 pCi/g	Nondetect	3

a. Three sample locations were selected for the CPP-03 Track 2 investigation. The sample locations were selected to investigate the three highest areas of contamination based on field surveys of surface soil radiation activity.

2. BACKGROUND

The Idaho National Laboratory (INL) Site encompasses 890 mi^2 (2,305 km^2) and is located approximately 34 mi (55 km) west of Idaho Falls in southeastern Idaho (Figure 2-1). The United States Atomic Energy Commission, now the DOE, established the Nuclear Reactor Testing Station, now the INL Site, in 1949 as a site for building and testing nuclear facilities. At present, the INL Site supports the engineering and operations efforts of DOE and other federal agencies in areas of nuclear safety research, reactor development, reactor operations and training, nuclear defense materials production, waste management and technology development, energy technology, and conservation programs.

2.1 INTEC—Waste Area Group 3

The Idaho Nuclear Technology and Engineering Center (INTEC), formerly known as the Idaho Chemical Processing Plant, is located in the south-central portion of the INL Site. From 1952 to 1992, operations at INTEC primarily involved reprocessing spent nuclear fuel from defense projects, which entailed extracting reusable uranium from the spent fuels. Liquid waste generated from the reprocessing activities, which ceased in 1992, is stored in an underground tank farm at INTEC. Both soil and groundwater contamination has resulted from these previous operations. Under the FFA/CO, the U.S. Environmental Protection Agency (EPA), Idaho Department of Environmental Quality (DEQ), and U.S. Department of Energy Idaho Operations Office (DOE-ID) (collectively referred to hereafter as the Agencies) are directing cleanup activities to reduce human health and environmental risk to acceptable levels. The INTEC is designated as Waste Area Group (WAG) 3, in accordance with the FFA/CO.

2.2 Operable Unit 3-13, Group 3, Other Surface Soils

WAG 3 was subdivided into 13 OUs that were investigated for contaminant releases to the environment. Fifty-five contaminant release sites were identified within OU 3-13 requiring remedial action to mitigate risks to human health and the environment under a future residential use scenario. These sites were then combined into seven groups that share common characteristics and contaminant sources. Group 3, Other Surface Soils, is further divided into Remediation Sets 1 through 6. Ten of the 55 release sites are included in Sets 1, 2, and 3. The characterization and remediation of Sets 1, 2, and 3 are to be completed as Phase I of the OU 3-13, Group 3, Other Surface Soils, remediation project.

Remediation Sets 1, 2, and 3 include the following release sites, which are indicated in Figure 2-2:

- Set 1: CPP-97, CPP-92, CPP-98, and CPP-99
- Set 2: CPP-37B and CPP-37C
- Set 3: CPP-03, CPP-37A, CPP-67, and CPP-34A/B.

Contaminants within these remediation sets include radionuclides, inorganics, and possible Resource Conservation and Recovery Act listed wastes. The OU 3-13 ROD identifies COCs for Group 3 to include americium (Am) -241; cesium (Cs) -137; europium (Eu) -152, Eu -154; plutonium (Pu) -238, -239, -240, and -241; strontium (Sr) -90; and mercury (Hg) (DOE-ID 1999).

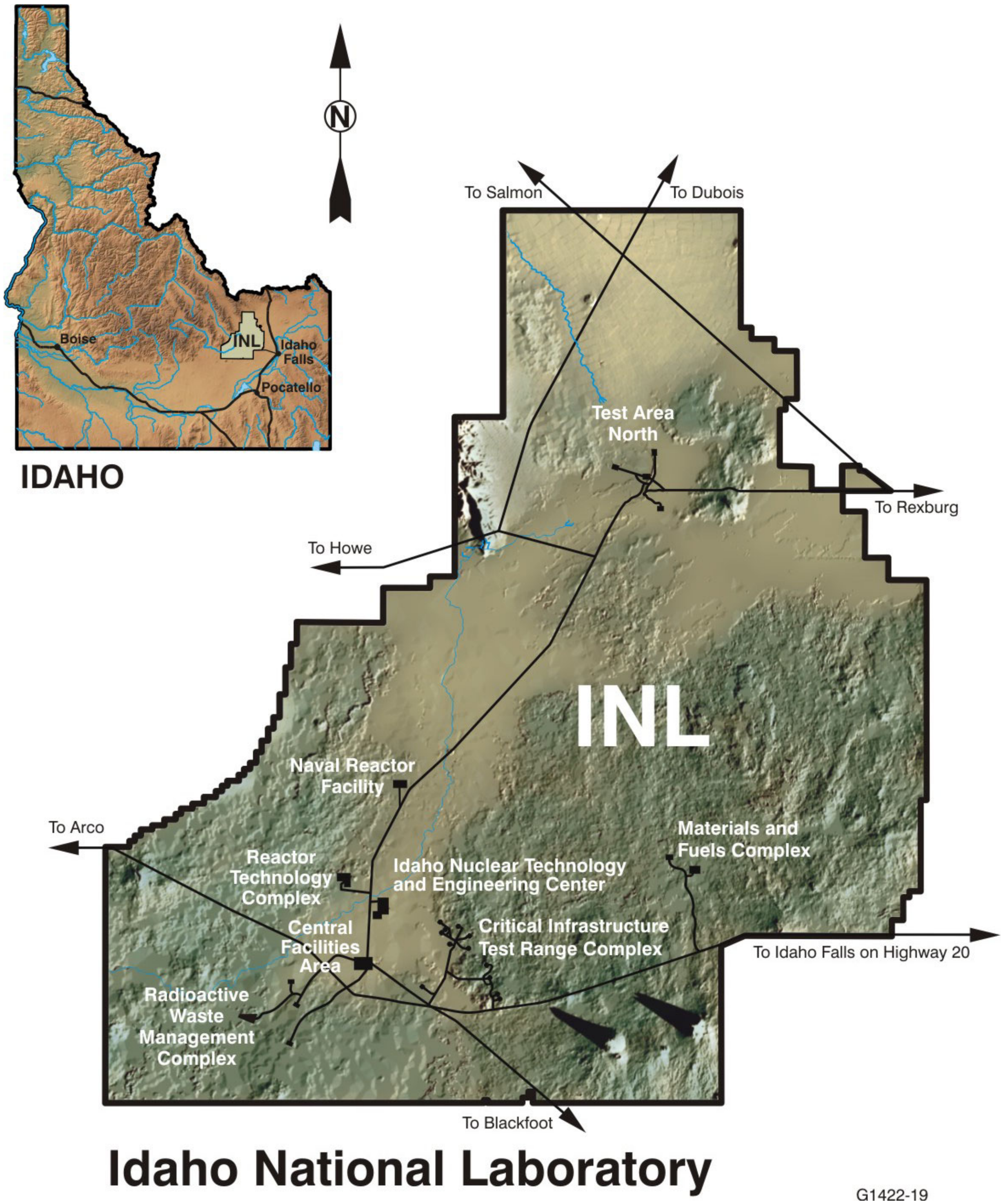


Figure 2-1. Location of the Idaho National Laboratory Site.

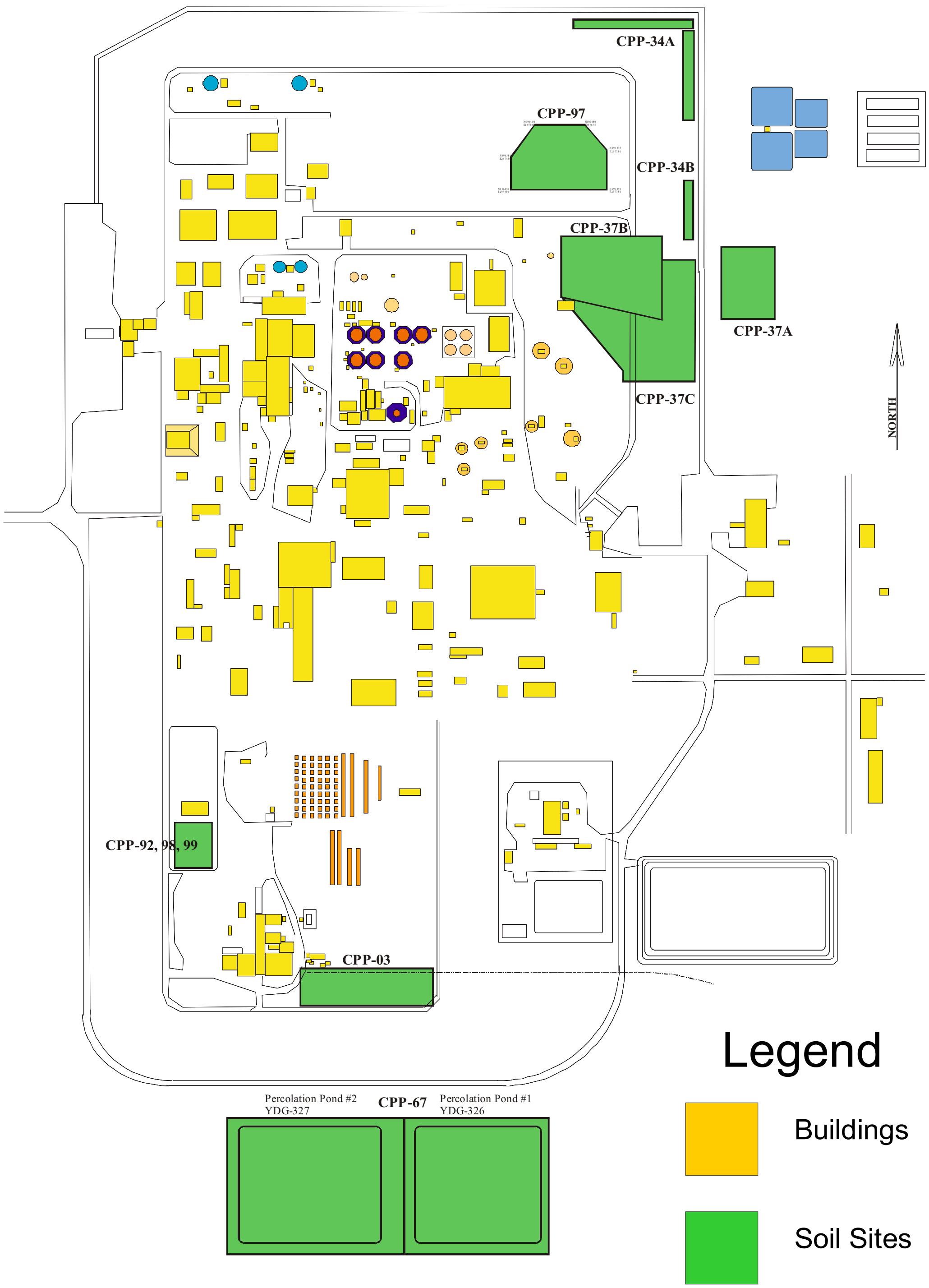


Figure 2-2. Operable Unit 3-13, Group 3, Other Surface Soils, Remediation Sets 1–3 (Phase I) sites.

2.3 Unit 3-13, Site CPP-03

2.3.1 Process Knowledge

Site CPP-03 is the location of a former temporary storage area southeast of the Fuel Receiving and Storage Facility at Building CPP-603. The dimensions of Site CPP-03 are approximately 150 × 500 ft (45.7 × 152.4 m). The area, commonly referred to as the "boneyard," was used to store old and abandoned radioactively contaminated equipment, such as tanks, valves, and fuel casks. The storage area was decommissioned in the mid 1970s, and contaminated equipment was packed into standard wooden radioactive waste boxes and taken to the Radioactive Waste Management Complex. The top several inches of underlying soil were contaminated due to the storage of equipment in the area. Most of the contaminated soil was removed, boxed, and sent to the Radioactive Waste Management Complex for disposal. Approximately 11 in. (0.3 m) of uncontaminated soil were placed over the area south of the railroad tracks and then graded to a level surface.

During the summer of 1983, radioactively contaminated soil was encountered when workers began to replace Tank WL-102 (in the tank farm area of INTEC). Approximately 12,000 yd^3 (9,270 m^3) of excavated contaminated soil (less than 30 mR/hr) from the WL-102 tank replacement project were temporarily stored at Site CPP-03. The contaminated soil was moved in August-September 1984 and placed in trenches in the northeast corner of the Idaho Chemical Processing Plant (CPP-34A/B).

Because the source of the WL-102 contaminated soil is associated with releases from the tank farm and Waste Calcining Facility condensate, potential contamination may include organic, inorganic, and radiological constituents, including I-129. Fluorinel waste was first generated at INTEC in 1986; therefore, hydrogen fluoride and cadmium were not involved in any of the releases associated with these soils.

The contaminated soil located in Site CPP-34 was characterized by drilling and sampling in 1990 (Golder 1990). The soil samples were analyzed for volatile organic constituents, semivolatile organic constituents, metals, herbicides, pesticides, and radiological constituents. The soil was not analyzed for iodine-129 (I-129) at that time. The soil was shown to contain concentrations of lead, mercury, and silver above background levels (Rood, Harris, and White 1995) but not exceeding extraction procedure-toxicity levels. The soil also contained bis(2-ethylhexyl)phthalate. Radiological analyses performed indicated low concentrations of Pu-238, Np-237, U-234, U-238, Cs-137, and Sr-90. Forty I-129 samples were collected during the excavation of Site CPP-34A and B during the spring of 2005. Of the 40 I-129 results, 7 results were UJ-flagged and 33 were U-flagged, which indicates that I-129 was not detected in these samples.

Based on the process knowledge and the sampling of the WL-102 soils in Site CPP-34, the COC for Site CPP-03 as determined by the OU 3-13 ROD (DOE-ID 1999) is Cs-137.

2.3.2 Physical Boundaries

The physical boundaries of Site CPP-03 are well defined by Willow Avenue to the south, Evergreen Street to the east, and the railroad tracks to the north (Figure 2-3). Examination of photos taken of the area in 1983 (Figure 2-4) and 1984 (Figure 2-5) clearly indicate that the WL-102 soils were not stored on either the railroad tracks or the south and east perimeter roads. Additionally, the WL-102 soil pile was limited to the eastern two-thirds of the CPP-03 area and did not extend over the western one-third of the site. The photos also indicate that the portion of Site CPP-03 north of the railroad tracks was also used for storage of materials and equipment.

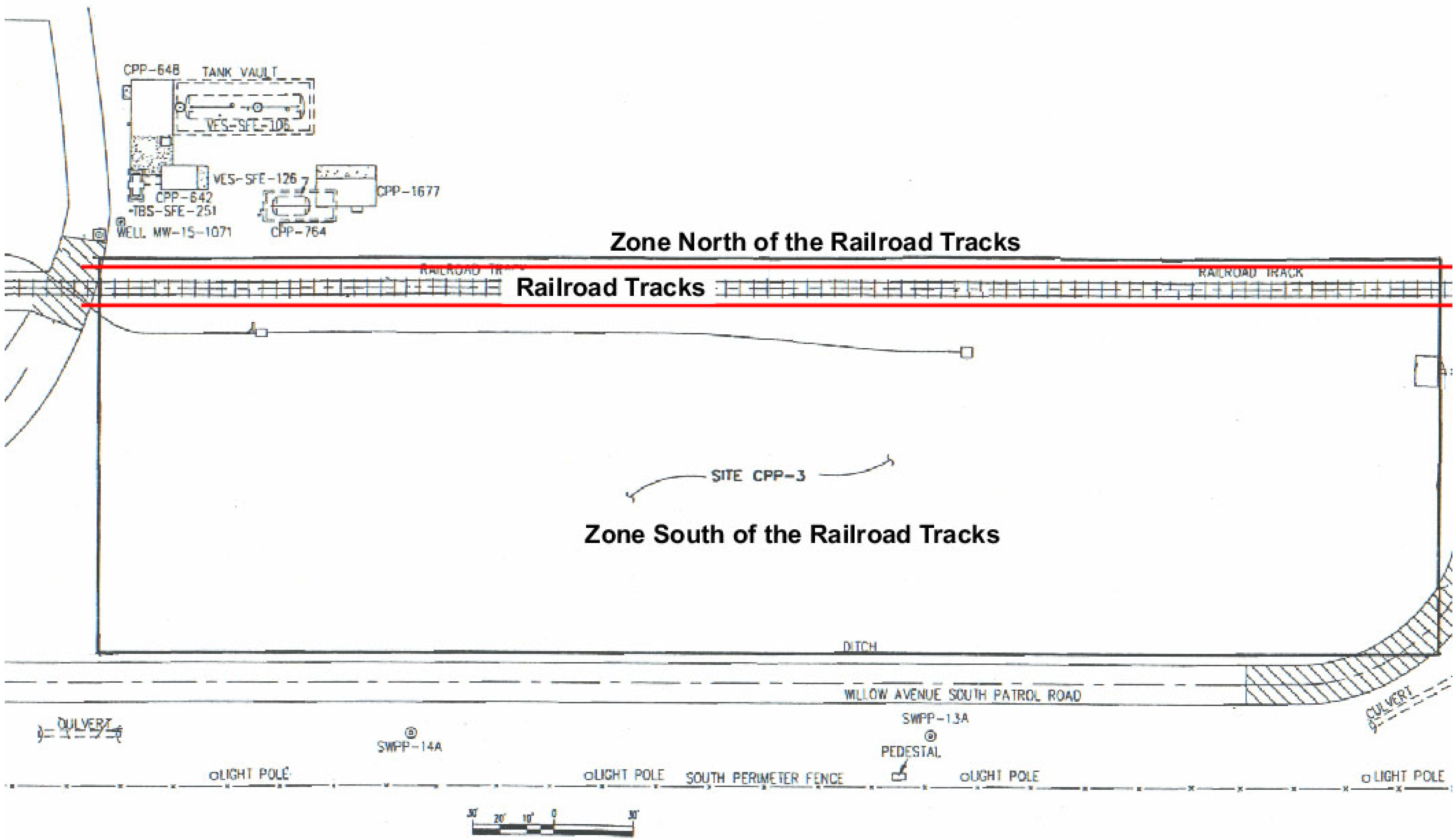


Figure 2-3. Map of Site CPP-03.

Figure 2-4. Photo of INTEC and Site CPP-03 area in 1983.

Figure 2-5. Photo of INTEC and Site CPP-03 area in 1984.

The railroad tracks and perimeter road were not used for the decontamination of equipment nor were they used for the storage of WL-102 soils. The area of the railroad tracks extending on both sides to a distance 1 ft beyond the railroad tie ends (the distance of rail car overhang) will be eliminated from the potential contamination zones of Site CPP-03. Field screening using a high-purity germanium (HPGe) detector will be used for real-time characterization of the railroad track bed. Any detected Cs-137 contamination exceeding the WAG 3 RG will be documented. The portion of the perimeter road located in the very southeast corner of Site CPP-03 will also be eliminated from the potential contamination zones of Site CPP-03. A notice of soil disturbance will be required if the railroad tracks or perimeter road is physically removed in the future. This notice and the associated process will then require surveys and investigation to determine if any contamination is present over the RGs for Cs-137 within the road or railroad track corridors.

Based upon previous use scenarios and history, Site CPP-03 can be divided into several zones based on previous use and likely methods and depths of contamination.

2.3.2.1 Zone North of the Railroad Tracks. The zone north of the railroad tracks was used for occasional storage of equipment and materials. The zone north of the railroad tracks has not been covered by additional soils since the use as a storage area. Therefore, any residual contamination would be evident on the surface.

2.3.2.2 Zone South of the Railroad (West Portion). The western one-third of Site CPP-03 was used for the storage of equipment and materials. Soil and materials were removed from this area in the mid 1970s, then the area was covered with up to 11 in. of soil. This zone will be defined as the western 150 ft of the portion of Site CPP-03 located south of the railroad tracks.

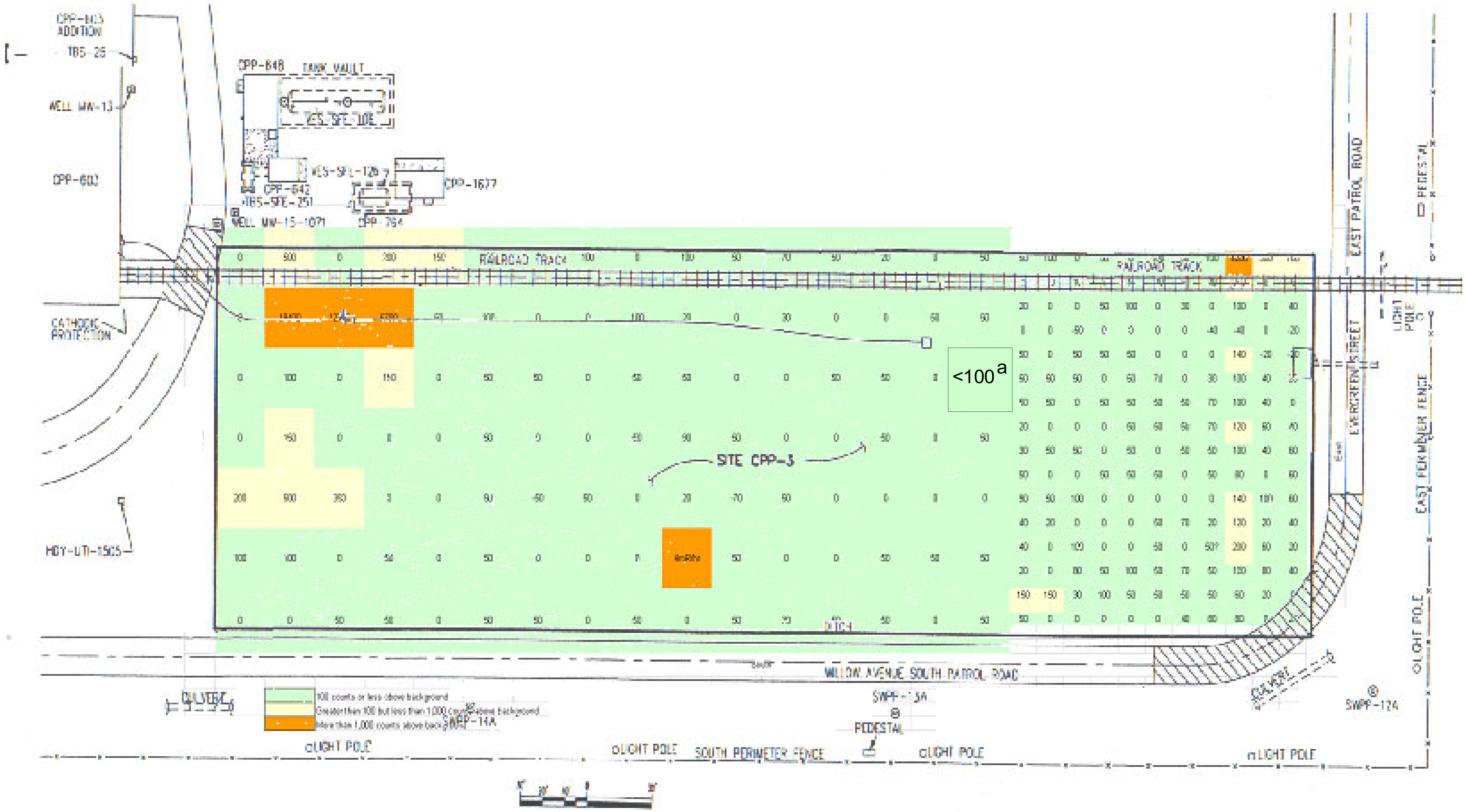
2.3.2.3 Zone South of the Railroad (East Portion). The eastern two-thirds of Site CPP-03 was also used for the storage of equipment and materials. Soil and materials were removed from this area in the mid 1970s, then the area was covered with up to 11 in. of soil. This area was used in 1983 and 1984 for the storage of soils excavated during the WL-102 tank farm upgrade. The soil pile was removed in 1984.

2.3.3 Previous Investigations

2.3.3.1 Surface Radiation Survey. A surface radiation survey was performed on October 18 and 19, 1993, of Site CPP-03. The survey was conducted through the use of a Ludlum 2A hand-held frisker at points determined by a systematic grid. Background radiation field measurements were made by placing the instrument at waist level and recording the reading. The surface radiation readings were completed by recording the highest radiation reading within 1 ft of the marked grid coordinate points (Figure 2-6 and Table 2-1).

Based on historical information, which indicates that the most contaminated material was stored in the eastern 20% of Site CPP-03, the eastern area measuring 100 × 150 ft (30.5 × 45.7 m) was divided into one hundred seventy-six 10- × 10-ft (3.0- × 3.0-m) grids and surveyed. Background levels in the eastern 20% area ranged between 80 cpm and 200 cpm, while a majority of the surface readings taken in the grids ranged between 100 cpm and 400 cpm. However, two locations in the northeastern corner of the area showed surface radioactivity of 1,000 cpm and 4,400 cpm.

The remaining 80% of the area, measuring 400 × 150 ft (121.9 × 45.7 m), was divided into one hundred twelve 25- × 25-ft (7.6- × 7.6-m) grids and surveyed. Radiation levels in the western 80% of Site CPP-03 ranged between 60 cpm and 20,000 cpm, with a majority of the readings between 100 cpm and 200 cpm. Three hot spots located in the northwestern corner of the site included readings of 7,000;



a. Ground contact reading was 100 counts per minute, the background reading was not recorded.

Figure 2-6. Map of Site CPP-03 with 1993 field radiation readings.

Table 2-1. 1993 field radiation levels in counts above background.

North

West

0	500	0	200	150	100	0	100	0	100	50	70	50	20	0	50
0	19400	12700	6700	50	100	0	0	100	20	0	30	0	0	50	50
0	100	0	150	0	50	50	0	50	50	0	0	50	50	0	<100[a]
0	150	0	0	0	50	0	0	50	90	50	0	0	50	0	50
200	500	350	0	0	50	-50	50	0	20	-70	50	0	0	0	0
100	100	0	50	0	50	0	0	0	4mR/hr	50	0	0	50	50	50
0	0	50	50	0	50	50	0	50	0	50	30	50	50	0	50

50	100	0	50	0	100	50	100	4200	300	780
10	40	10	-10	10	-10	30	40	240	0	0
20	0	0	50	100	0	30	0	100	0	40
0	0	-50	0	0	0	0	-40	-40	0	-20
50	0	50	50	50	0	0	0	140	-20	-20
50	50	50	0	50	70	0	30	100	40	20
50	50	0	50	50	50	50	70	100	40	0
20	0	0	0	50	50	50	70	120	60	40
30	50	50	0	50	0	50	50	100	40	60
50	0	0	50	50	50	0	50	80	0	60
90	50	100	0	0	0	0	0	140	100	60
40	20	0	0	0	50	70	20	120	20	40
40	0	100	0	0	50	0	50?	200	60	20
20	0	80	50	100	50	70	50	100	80	40
150	150	30	100	50	50	50	50	60	20	0
50	0	0	0	0	0	40	80	80	0	20

South

100 counts or less above background
Greater than 100 but less than 1,000 counts above background
More than 1,000 counts above background

a. Ground contact reading was 100 counts per minute, the background reading was not recorded.

13,000; and 20,000 cpm; and one hot spot, located near the center of the site, had a reading of 4 mR/hr. Results of the field radiation survey are included in the OU 3-09 Preliminary Scoping Track 2 Summary Report (LITCO 1995). Radiation readings as counts above background are shown in Figure 2-6.

The 11 in. of soil placed over the site may be providing an unknown amount of shielding, and higher levels of radiation may be encountered below the 11-in (0.3-m) depth. If an even layer of soil was placed over the area, it can be assumed the soil would be providing an even amount of shielding and the hot spots identified from the field survey would still represent the areas of highest contamination. However, the field team reported that the southern hot spot was found to represent a single contaminated large-sized gravel cobble. The gravel cobble was then removed by radiological control technicians (RCTs) in their normal site surveys.

The northeastern corner of Site CPP-03 was resurveyed on December 9, 1993, to determine if contamination extended to the north of Site CPP-03. There was concern contamination may be present outside the area covered by the October survey. A 20- × 30-ft (6.0- × 9.1-m) area was surveyed, and radiation levels were only slightly above background levels. Personnel performing the field survey had to scrape away several inches of snowfall covering the ground at each location before radiation measurements could be taken. Since the two radiation surveys were taken at separate times and under different field conditions, the data from the December survey can only be used for indirect comparison to the October data. The results of the survey are included in Appendix B of the OU 3-09 Track 2 Sampling and Analysis Plan (WINCO 1993).

2.3.3.2 Soil Sampling of Site CPP-03. Three Track 2 soil borings in Site CPP-03 were located based on the results of the October 1993 radiological survey (LITCO 1995). The sample borings were located at the highest radiation levels observed during the surface survey (Figure 2-7). One soil boring was drilled in the eastern 20% of the 150- × 500-ft (45.7- × 152.4-m) area. The sample location numbers shown in Figure 2-7 are from the original field logbook and from the Track 2 Summary Report for Operable Unit 3-09 (LITCO 1995). The sample locations were improperly referenced in the Remedial Design/Remedial Action (RD/RA) Work Plan (DOE-ID 2004b). Borehole CPP-03-3 was located near the northeast corner of the area and north of the railroad tracks. The other two sample borings were drilled in the remaining area of Site CPP-03. Borehole CPP-03-2 (A and B) was located near the northwest corner of the area but south of the railroad tracks. Borehole CPP-03-1 was located near the south boundary of the area approximately midway between the east and west boundaries. The soil borings were extended to an approximate depth of 10 ft (3.0 m) below ground surface (bgs).

A soil sample was collected between 0 to 0.5 ft (0 to 0.15 m) bgs in each of the three boreholes. Continuous samples were taken between 0.5 to 4 ft (0.15 to 1.2 m) bgs using split-spoon samplers in Boreholes CPP-03-1 and CPP-03-3, and the sample collected from the interval having the highest radiation level was sent for laboratory analyses. Continuous samples were also taken between 1.2 to 3.0 m (4 to 10 ft), and the sample collected from the interval having the highest radiation level was also sent for laboratory analyses.

The drilling crew and samplers were unable to advance Borehole CPP-03-2 (A) beyond a depth of 1.5 ft. Samples were collected from the 0- to 0.5-ft (0- to 0.15-m) bgs zone and from 0.5- to 0.7-ft (1.15- to 1.2-m) zones. The drill rig was then moved 2 ft to the north and a second borehole (CPP-03-2 [B]) was advanced without sampling to a depth of 2 ft. A split-spoon sample was collected from the 2- to 4-ft (0.6- to 1.2-m) zone but was found to have lower field radiation measurements than the 0.5- to 0.7-ft sample from Borehole CPP-03-2 (A). Therefore, the sample from 0.5 to 0.7 ft was sent for laboratory analyses. Continuous samples were then taken between 4 to 10 ft (1.2 to 3.0 m), and the sample collected from the interval having the highest radiation level was sent for laboratory analyses.

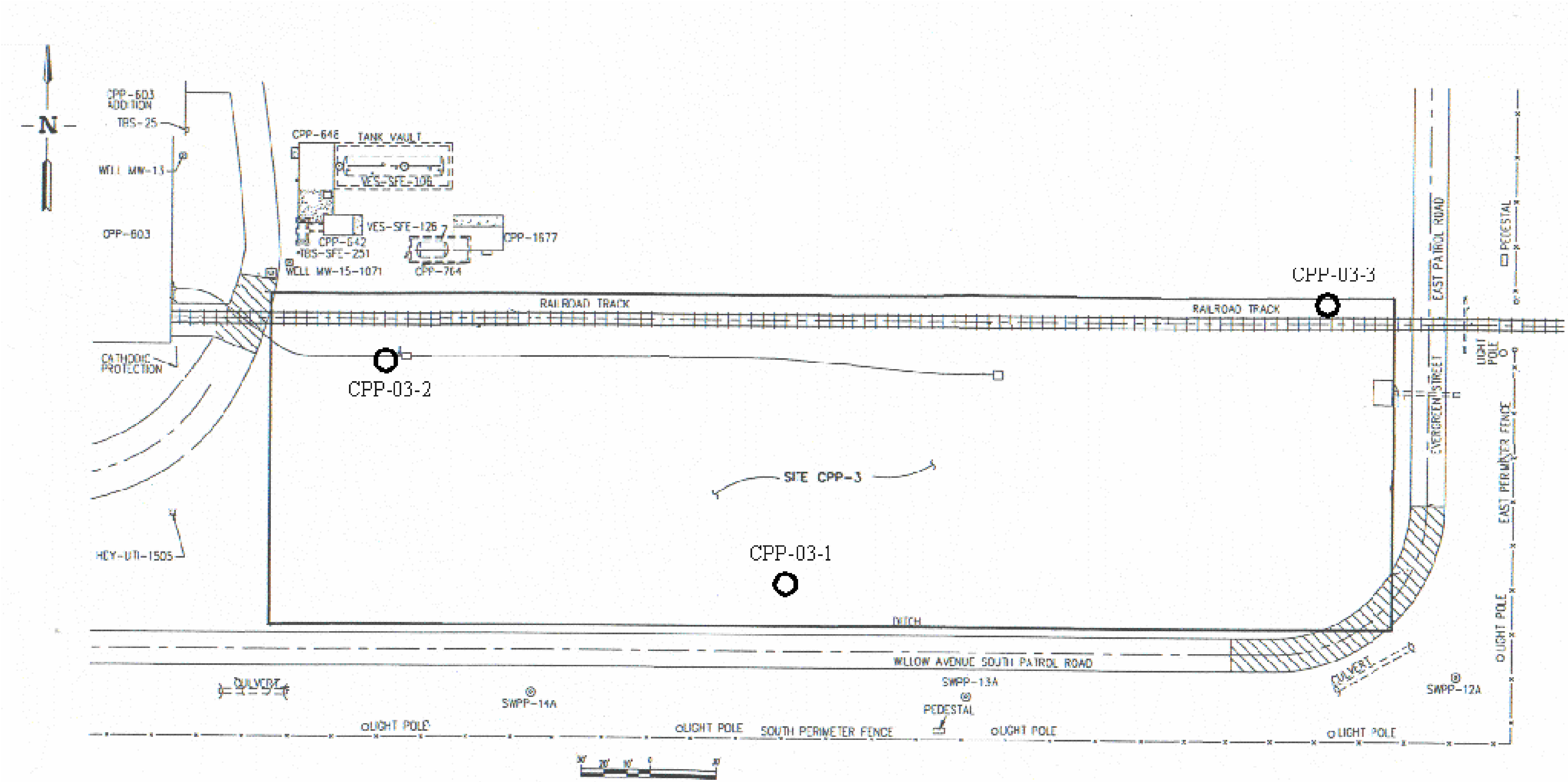


Figure 2-7. Map of Site CPP-03 with 1994 sampling locations.

Radiation levels of soils at 10 ft (3.0 m) bgs were at or below background levels for each of the three CPP-03 boreholes; therefore, the boreholes were not extended to the soil/basalt interface.

The results of the nine samples collected in Boreholes CPP-03-1, CPP-03-2, and CPP-03-3 are summarized in Table 2-2. Cs-137 was detected at activity levels above background in surficial samples from each sample boring at CPP-03 at activities ranging from 1.4 pCi/g at CPP-03-1 to 65.1 pCi/g at CPP-03-2. Cs-137 was also detected at activities above background in samples collected from 0.5 to 2.0 ft (0.15 to 0.6 m) in borings CPP-03-1 and CPP-03-3, and from 0.5 to 1.5 ft (0.15 to 0.45 m) at boring CPP-03-2. Cs-137 activities in those samples ranged from 24.4 pCi/g at CPP-03-2 to 1.96 pCi/g at CPP-03-1. Sr-90 was also detected in surficial samples from CPP-03-2 and CPP-03-3, at activities ranging from 43.9 pCi/g to 16 pCi/g.

Table 2-2. Sampling data for cesium-137 from 1994 OU 3-09 investigation (LITCO 1995).

Location	Sample Description	Risk-Based Interval (ft)		Actual Depth of Sample (ft)		Cs-137 (pCi/g)	Counts Above Background on Ludlum 2A
CPP-03-1	South location	0	to 0.5	0	to 0.5	1.4	0
CPP-03-1	South location	0.5	to 2.0	0.5	to 1.5	1.96	25
CPP-03-1	South location	2.0	to 10.0	2.0	to 4.0	—[a]	0
CPP-03-1	South location	2.0	to 10.0	4.0	to 6.0	—[a]	0
CPP-03-1	South location	2.0	to 10.0	6.0	to 8.0	—[a]	0
CPP-03-1	South location	2.0	to 10.0	8.0	to 10.0	0.253	0
CPP-03-2 (A)	West location (1st hole)	0	to 0.5	0	to 0.5	65.1	50
CPP-03-2 (A)	West location (1st hole)	0.5	to 2.0	0.5	to 0.7	24.4	0
CPP-03-2 (B)	West location (2nd hole)	2.0	to 10.0	2.0	to 4.0	—[a]	0
CPP-03-2 (B)	West location (2nd hole)	2.0	to 10.0	4.0	to 6.0	—[a]	0
CPP-03-2 (B)	West location (2nd hole)	2.0	to 10.0	6.0	to 8.0	—[a]	0
CPP-03-2 (B)	West location (2nd hole)	2.0	to 10.0	8.0	to 10.0	Nondetect	0
CPP-03-3	East location	0	to 0.5	0	to 0.5	41.9	600
CPP-03-3	East location	0.5	to 2.0	0.5	to 2.0	1.09	0
CPP-03-3	East location	2.0	to 10.0	2.0	to 4.0	—[a]	0
CPP-03-3	East location	2.0	to 10.0	4.0	to 6.0	—[a]	0
CPP-03-3	East location	2.0	to 10.0	6.0	to 8.0	—[a]	0
CPP-03-3	East location	2.0	to 10.0	8.0	to 10.0	Nondetect	0

a. The OU 3-09 sampling plan required one sample to be submitted for analysis in the 2- to 10-ft below surface zone. The plan required the interval with the highest field-detectable radiation to be submitted. The deepest soil sample was submitted if no activity was detected.

2.3.3.3 Sampling of WL-102 Soils. Soil from the excavation of Tank WL-102 (in the tank farm area of INTEC) were stored at Site CPP-03 in 1983. This soil was then moved to Site CPP-34 in the summer of 1984. The WL-102 soils have been fully characterized as described in Section 2.3.1. These characterization data have been used to develop a waste profile for the disposition of materials from both Site CPP-34 and Site CPP-03. This is based on the RD/RA Work Plan that identifies that the contamination at CPP-03 would be similar to CPP-34. The I-129 sample data collected at CPP-34 will also be used for the waste profile for these sites. Of the 40 I-129 results received from sampling of CPP-34A/B, 7 results were flagged UJ (false positive), and 33 were flagged U (nondetect). In summary, soils excavated from the CPP-03 site will be dispositioned under the approved CPP-03/ CPP-34 waste profile.

2.3.3.4 Ground-Penetrating Radar. A ground-penetrating radar (GPR) survey was performed by Westinghouse Idaho Nuclear Company personnel over the eastern one-half of Site CPP-03 on June 27, 1994, to determine whether pieces of construction debris may have been buried in a trench in the area. The GPR survey was spaced at 25-ft (7.6-m) intervals, and the survey equipment could detect subsurface anomalies to approximately 8 ft (2.4 m) bgs. No large pieces of debris were detected, and the GPR equipment observed only small miscellaneous debris (such as small pieces of pipe).

3. SAMPLING AND DATA QUALITY OBJECTIVES

The following sections outline the objectives of the sampling activities described in this FSP and the criteria associated with data collected. DQOs and measurement performance criteria are developed and discussed in detail.

3.1 Data Quality Objectives

The DQO process, which is used to specify the objectives for the data collected, was designed as a specific planning tool to establish criteria for defensible decision-making and to facilitate the design of the data acquisition efforts. The DQO process is described in the EPA document *Data Quality Objectives for Hazardous Waste Site Investigations* (EPA 2000). The DQO process includes seven steps, each of which has specific outputs. Each of the following subsections corresponds to a section in the DQO process and provides the output for each step.

3.1.1 Problem Statement

The first step in the DQO process is to use relevant information to clearly and concisely state the problem to be resolved. Its intent is to define the problem so that the focus of the sampling and analysis will be unambiguous.

The ROD declaration states, in part, that conventional excavation methods will be used to remove contaminated soils and debris above the 1×10^{-4} risk level (based on an assumed future residential use in the year 2095 and beyond) and replace the contaminated soil with clean soil, so that from the surface to a depth of 10 ft (3 m), the land can be released for future residential use (DOE-ID 1999). However, the ROD also states that contamination ***below*** 10 ft (3 m) be investigated to determine if any contamination below 10 ft posses a risk to the underlying aquifer.

An excavation decision process, specified in the Remedial Design/Remedial Action (RD/RA) Work Plan (DOE-ID 2004b), has been developed to evaluate whether soil contamination has been removed to a level that is protective of human health and the environment. This decision process specifies that the soil RGs are the action levels (ALs) up to 10 ft below ground surface. Previous sampling within Site CPP-03 has demonstrated that the contamination present in the area does not extend to depths greater than 2 ft bgs. Therefore, the DQO problem statements for this FSP will concentrate on quantifying the contamination present in the upper 2 ft of the soil column. If any required soil excavations reach this FSP depth of 2 ft and contamination concentrations are above the Cs-137 RG, 23 pCi/g, then the excavation will be continued, and depth and extent of the additional excavation will be determined through verification sampling as outlined in the *Operable Unit 3-13, Group 3, Other Surface Soils Remediation Sets 1–3 (Phase I) Field Sampling Plan* (DOE-ID 2004c). If any required excavation reaches 10 ft below grade and soil contaminant concentrations are still above the RGs, additional samples will be collected as outlined in DOE-ID (2004c).

The problem statement for the OU 3-13, Group 3, Other Surface Soils, Site CPP-03 is, then, as follows: sampling is required to determine which portions of Site CPP-03 have contaminant concentrations that exceed CERCLA RGs for soil.

Table 3-1 shows those COCs within Site CPP-03 exceeding the RGs based on previous sampling efforts.

Table 3-1. Contaminants of concern exceeding remedial goals identified from previous sampling efforts.

Site	Description	COCs
CPP-03	Temporary storage area southeast of CPP-603	Cs-137

3.1.2 Principal Study Questions and Decision Statements

This step in the DQO process identifies the decisions and actions that will be taken based on the data collected for a given site. The study questions and their corresponding alternative actions (AAs) will then be joined to form decision statements (DSs). The objective of this characterization activity is to answer the principal study questions (PSQs).

The objective of the soil sampling specified in this FSP is to answer the following PSQ and to confirm compliance with CERCLA RGs:

- PSQ 1: Do residual concentrations of contaminants in the soils at Site CPP-03 meet the associated CERCLA RGs?

  The AAs to be taken, depending on the resolution to PSQ 1, are as follows:

  - AA 1.1: If the residual concentrations of contaminants for which CERCLA RGs have been established meet the associated CERCLA RGs, then no further action is required for the soils in Site CPP-03.
  - AA 1.2: If the residual concentrations of contaminants for which CERCLA RGs have been established do <u>not</u> meet the associated CERCLA RGs, then the area that exceeds the RGs will be excavated. Any required excavation will be evaluated for compliance to CERCLA RGs per DOE-ID (2004c).

  Combining PSQ 1 and the associated AAs results in the following DS:

- DS 1: Determine if the residual concentrations of soil Cs-137 within Site CPP-03 meet the associated CERCLA RG, or if additional excavation or other remediation activities are required.

3.1.3 Decision Inputs

The purpose of this step is to identify informational inputs that will be required to resolve the DSs and to determine which inputs require measurements.

The information required to resolve DS 1 is the identification and quantification of the soil Cs-137 contamination concentration present in the soils within Site CPP-03. The ALs to resolve DS 1 are the Other Surface Soils RGs defined in the OU 3-13 ROD (DOE-ID 1999).

3.1.4 Study Boundaries

The primary objectives of this step are to identify the population of interest, define the spatial and temporal boundaries that apply to each DS, define the scale of decision-making, and identify practical constraints that must be considered in the sampling design. Implementing this step helps ensure that the sampling design will result in the collection of data that accurately reflects the true condition of the site under investigation.

The spatial boundaries of concern for this sampling effort are confined to the soil areas within the Site CPP-03 boundaries. The investigation boundaries are assumed to be adequately defined for this site with the changes proposed in Section 2.3.2.

Results obtained from this sampling effort will be considered as adequate to confirm compliance with the OU 3-13 ROD requirements. No practical constraints are expected to be encountered that would interfere with the collection of adequate soil volumes for analyses. Any limitations on data quality and/or usability resulting from sample collection constraints will be discussed in the data quality assessment (DQA) report.

3.1.5 Decision Rules

The objective of this step is to define parameters of interest that characterize the population, specify the AL, and integrate previous DQO outputs into a single statement that defines the conditions that would cause the decision-maker to choose among AAs. The decision rule typically takes the form of an "***If…then***" statement describing the action to take if one or more conditions are met.

The decision rule is specified in relation to a statistical parameter that characterizes the population of interest. The parameter of interest for the Other Surface Soil samples will be the true mean concentration. The decision rule will involve a hypothesis test, described in Section 3.1.6. The hypothesis test will be performed assuming the data follow a normal distribution or can be transformed to follow a normal distribution using guidance from EPA (1989). The data will be tested for normality using the Shapiro-Wilk test and transformed if necessary. This procedure, however, is robust to departures from normality (Conover 1980). If a log transformation is made, then the transformed sample mean will be compared to the log-transformed RG.

The decision rule is based on the requirement that residual contaminant concentrations in the CPP-03 site meet the ROD-specified CERCLA RGs with respect to the COCs for the site.

The decision rules are as follows:

- ***If*** the true mean concentration of Cs-137 within Site CPP-03 meets the associated CERCLA RG, ***then*** no subsequent remediation activities will be required.
- ***If*** the true mean concentration of Cs-137 within Site CPP-03 exceeds the associated CERCLA RG ***then*** subsequent remediation activities to remove the soils that exceed the RGs will be evaluated.

3.1.6 Decision Error Limits

Since analytical data can only estimate the true condition of the site under investigation, decisions based on measurement data could potentially be in error. For this reason, the primary objective of this step is to determine if the DS developed for the Site CPP-03 investigation requires a statistically based sample design. Determining the decision error limits specifies the decision-maker's tolerable limits on decision errors, which are used to establish performance goals for the data collection design.

Because decisions are based on measurement data, which provide an estimate of the true state of the media being characterized and have inherent uncertainty, decisions could be in error. Therefore, tolerable limits on the probability of making a decision error must be defined. The probability of decision errors can be controlled by collecting enough proper data to select between one condition of the environment (i.e., the soil following excavation of the Other Surface Soils sites) and the alternative condition. One condition is assumed to be the baseline condition and is referred to as the *null hypothesis* (H_0). The alternative condition is the *alternative hypothesis* (H_A). The null hypothesis is presumed to be true in the absence of strong evidence to the contrary, which allows decision-makers to guard against making the decision error with the most undesirable consequences. The null hypothesis is the assumption that the true mean concentration exceeds the RG. The alternative hypothesis is the assumption that the true mean concentration does not exceed the RG.

A decision error occurs when the decision-maker rejects the null hypothesis when it is true or fails to reject the null hypothesis when it is false. These two types of decision errors are classified as *false positive* and *false negative* decision errors, respectively. False positive and false negative errors are defined in accordance with the definition of the null and alternative hypothesis. For example, a decision-maker presumes a certain waste is hazardous (i.e., the null hypothesis is "the waste is hazardous"). If the data lead the decision-maker to conclude that the waste is not hazardous when it truly is hazardous, then the decision-maker would make a false positive decision error. Statisticians refer to this error as a Type I error. The measure of the size of this error is called alpha (α), which is the level of significance or the size of the critical region. If, however, the data lead the decision-maker to conclude that the waste is hazardous when, in fact, it is not, then the decision-maker would make a false negative decision error. Statisticians refer to this error as a Type II error. The measure of the size of this error is called beta (β) and is also known as the complement of the power of a hypothesis test.

The possibility of decision error cannot be eliminated but it can be minimized, which is accomplished by controlling the total study error. Methods for controlling total study error include collecting a large number of samples to minimize uncertainty, selecting a probability sample design, analyzing individual samples several times, or using more precise analytical methods (to control measurement error). The chosen method for reducing decision errors depends on where the greatest component of total study error exists in the process and the ease of implementing error-reduction steps. The amount of effort expended on controlling decision error is directly proportional to the consequences of making an error.

The decision error that has the more severe consequences must be specified, as it is the basis for establishing the null hypothesis. For regulatory compliance, human health, or environmental risk issues, the null hypothesis is specified so that the error associated with rejecting it has the most adverse consequences. In statistical hypothesis testing, the data must beyond a reasonable doubt demonstrate that the null hypothesis is false, in order to reject the null hypothesis. Therefore, the burden of proof is to demonstrate that the decision error with the most adverse consequence is unlikely to occur.

For DS 1, the mean concentrations of COCs will be assumed to exceed the CERCLA RGs unless proven otherwise (i.e., by collecting and analyzing samples following soil excavation). Thus, the alternative hypothesis is that the mean concentrations of COCs do not exceed the CERCLA RGs.

A range of possible parameter values must be specified where the consequences of decision errors are relatively minor. This range of values is referred to as the "gray region," which is bounded on one side by the AL and on the other side by the parameter value where making a false negative decision error begins to be significant (U). Specifying the gray region is necessary because the variability in the sample population and unavoidable imprecision in the measurement system combine to produce variability in the data such that a decision may be "too close to call" when the true parameter value is very close to the AL. In statistics, this interval is called the "minimum detectable difference" and is expressed as delta (Δ). The width of this gray region is critical in calculating the number of samples needed to satisfy the DQOs. A narrow gray region indicates a desire to detect conclusively the condition when the true parameter value is close to the AL. For the Other Surface Soils total constituent analysis, the gray region will be bounded on one side by the constituent-specific AL (i.e., RG) and on the other side by a value that is 70% of the constituent-specific AL.

The final activity required in specifying the tolerable limits on decision error is to assign values to the gray region that reflect the probability of decision errors occurring. These probability values are the decision-maker's tolerable limits for making an incorrect decision. These values are determined by selecting a possible true value for the parameter of interest, then choosing a probability limit based on an evaluation of the seriousness of the potential consequences of making a decision error if the true parameter value is located at that point.

The sample collection design for the Site CPP-03 sampling activities is discussed in the following section. An acceptable false positive decision error value of 0.05 (when the true mean concentration is equal to the AL) and an acceptable false negative decision error value of 0.20 (when the true mean concentration is equal to U) have been selected for this sampling design.

3.1.7 Design Optimization

The objective of this step is to identify the best sampling and analysis design that satisfies the previous DQO Steps 1 through 6. The activities required to optimize the design include

- Review the outputs of the first six steps and existing environmental data
- Develop general data collection design alternatives
- Formulate a mathematical expression needed to solve the design problem for each data collection design alternative
- Select the optimal number of samples to satisfy the DQOs for each data collection design alternative
- Select the most resource-effective data collection design that satisfies all the DQOs.

A systematic random sampling design will be used to determine sampling locations. (Additional bias samples may be collected if radiological screening identifies high areas of contamination or if soil staining is visible.) With the systematic random sampling approach, a grid is used to divide the sampling area into potential sampling locations and a starting point is randomly selected. Samples are then collected at even intervals from the start point. Since samples are collected at regular intervals, systematic sampling is appropriate when the goal is to obtain an overall characterization of a site. For the Site CPP-03 investigation, the characterization goal is to determine if mean contamination exceeds established cleanup levels.

Although a systematic sample will be taken, a simple random sample design will be assumed for calculating the necessary sample size. Assuming any contamination is located randomly and not along a gradient, this approach produces unbiased estimates of the variance (EPA 1989) and equivalent sample size determination. When using a simple or composite random sampling approach, there are commonly accepted mathematical expressions to solve design problems for these sample design alternatives (EPA 1989). The formula for determining the number of samples to be collected is based on the hypothesis test and data collection design. In this case, the hypothesis test will be of the null hypothesis that the concentration exceeds the AL versus the alternative hypothesis that the concentration is below the AL. The formula provided adjusts for using the standard normal Z instead of iteratively using the t distribution to determine sample size. Using this hypothesis test, the formula shown in Equation (3-1) is used for computing the number of samples required to be collected for a simple random sampling approach:

$$n = \frac{\hat{\sigma}^2 \left(z_{1-\beta} + z_{1-\alpha}\right)^2}{\Delta^2} + (.5) z_{1-\alpha}{}^2 \qquad (3\text{-}1)$$

where

n	=	number of samples required
$\hat{\sigma}^2$	=	estimated variance in measurements
z	=	the p^{th} percentile of the standard normal distribution (from statistical tables)
Δ	=	AL - U (the minimum detectable difference)
AL	=	action level
U	=	parameter value where making a false negative decision error begins to be significant.

Data from *Background Dose Equivalent Rates and Surficial Soil Metal and Radionuclide Concentrations for the Idaho National Engineering Laboratory* (INEL 1996) were used to determine appropriate coefficients of variance (CVs) for background soils at the INL Site. The CV is used because it is assumed to be independent of the mean concentration, which is not the case in general for the variance. The CVs for the COCs are 46% for Cs-137, 38% for Sr-90, and 37% for mercury. The maximum CV of 46% was used to determine sample size. A gray area width equal to 30% of the AL was used because the maximum background concentrations are less than 5% of the RGs (INEL 1996). All background concentration sample results for the three COCs are less than 1 pCi/g or mg/g, while the RGs are 23 pCi/g, 223 pCi/g, and 23 mg/g for Cs-137, Sr-90, and mercury, respectively. Thus, post-remediation levels should be much less than 70% of the AL, and the decision criteria should be met without excessive sampling. Using a width of the gray area that is 30% of the AL results in U being defined as 70% of the AL. To calculate the sample size, the lower value of the gray area, U, is assumed to be true. Thus, the variance in Equation 3-1 is based on the CV as 46% of U. Because U is 70% of AL the variance is estimated as (0.46)(0.7)AL = 32% AL. Assuming an acceptable chance of false positive decision error to be 5% when the true concentration is equal to the AL and an acceptable chance of false negative decision error to be 20% when the true concentration is equal to U, the following equation shows the solution for n (number of samples required) using the project-specific variables. The values for 1-α and 1-β were obtained from EPA guidance (EPA 1989). The sample size is rounded up to the next largest integer (see Equation 3-2).

$$n = \frac{32^2 (0.842 + 1.645)^2}{30^2} + (0.5)(1.645)^2 = 7.5 \uparrow 8 \quad . \qquad (3\text{-}2)$$

This indicates that a minimum of eight samples need to be collected from Site CPP-03. Sampling to support a gray area decision within 80% of the AL would amount to 15 additional samples being collected. If these additional samples do not refute the null hypothesis that the soil concentrations exceed the AL, then additional remediation will be performed. If these additional samples support the alternative hypothesis, then the site will be released.

3.2 Measurement Performance Criteria

The measurement quality objectives specify that measurements will meet or surpass the minimum requirements for data quality indicators established in the QAPjP (DOE-ID 2004a). As a result, the technical and statistical quality of these measurements must be properly documented. Precision, accuracy, method detection limits (MDLs), and completeness must be specified for physical/chemical measurements. Additional analytical requirements are described qualitatively in terms of representativeness and comparability. These measurement quality objectives are described in the following sections. Table 3-2 presents the analytical performance requirements.

Precision is a measure of agreement or reproducibility among individual measurements for the same property under the same conditions. Precision is expressed as relative percent difference, which is defined, and shown in Equation (3-3), as the absolute value of the difference divided by the mean, then expressed as a percentage.

$$RPD = \frac{|MS - MSD|}{(MS + MSD)/2} x100 \tag{3-3}$$

where

RPD = relative percent difference

MS = measured concentration of parameter in matrix spike sample

MSD = measured concentration of parameter in matrix spike duplicate sample.

For all radiochemical measurements, precision will be calculated using duplicate measurements of the same sample. Replicate measurements are used for metals determination after sample preparation, during instrumental analysis, and for mercury determinations postdigestion. Radiochemical measurements will use separate sample splits for solid samples to determine measurement precision.

Acceptable laboratory precision will be determined by method-specific criteria outlined in SW-846, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (EPA 1996) for total metals and each requested organic analysis. Acceptable radiochemical measurement precision will be determined using the guidance outlined in ER-SOW-394, "Sample and Analysis Management Statement of Work for Analytical Services."

3.2.1 Accuracy

Accuracy is the relative agreement or nonagreement between a measured value and an accepted reference value. Accuracy reflects the bias associated with a measurement and is determined by assessing actual measurements in the sample matrix during the analysis of matrix spike samples. Accuracy is assessed by means of determining analyte recovery from matrix spikes, samples, or laboratory reference samples and is expressed as a percent recovery (%R). It is defined as the measured value divided by the true value expressed as a percent, as shown in Equation (3-4).

Table 3-2. Analytical performance requirements.

Analyte List	Survey/ Analytical Method	Preliminary Action Level	Practical Quantitation Limit	Precision Requirement	Accuracy Requirement
Gamma emitters (Cs-137)	Gamma spectroscopy	Cs-137 ≥23 pCi/g	0.1 pCi/g	±20%	80-120%

$$\%R \frac{C_{ss} - C_{us}}{C_{as}} x100 \tag{3-4}$$

where

$\%R$	=	percent recovery
C_{ss}	=	measured analyte concentration in spiked sample
C_{us}	=	measured analyte concentration in nonspiked samples (or zero for laboratory reference samples)
C_{as}	=	calculated or certified analyte concentration added to sample.

For inorganic analyses, the analytical laboratory will represent the accuracy of their measurements in the sample matrix as the results of the matrix spike data. Acceptable laboratory accuracy will be determined by assessing the results against method-specific criteria outlined in SW-846 (EPA 1996) for total metals and each requested organic analysis. Radiochemical method accuracy will be determined by assessing the results against the criteria outlined in ER-SOW-394. During the DQA process, accuracy of the environmental measurements (in the form of bias, may be indicated by the measure discussed above) will be assessed to determine if there are any impacts on data use due to the accuracy of the data.

3.2.2 Detection Limits

The laboratory will use guidance found in SW-846 (EPA 1996) or 40 CFR 136, Appendix B, to aid in appropriately determining MDLs for organic and inorganic analytical methods and the requirements of ER-SOW-394 for setting minimum detectable activities (MDAs) for radiochemical measurements. The MDLs and MDAs are defined as the minimum concentration or activity of a substance that can be reliably measured and reported by a particular analytical method. Matrix effects, sample size, radiation levels, or other analytical interferences may increase MDLs or MDAs. The effects of these conditions on the laboratory's MDLs or MDAs, if determinable, will be documented.

Chemical methods for all total metals and other analyses typically use the standard deviation of replicate measurements of standards multiplied by a factor specified by the method or laboratory Statement of Work to determine minimum MDLs. Estimated detection limits are provided in each of the appropriate analytical methods for chemical determinations and serve as a guide for purposes of this FSP. The laboratory will use standard radiochemistry and chemical analysis practices to ensure the MDLs approach those prescribed in the analytical laboratory Statement of Work. Any significant deviations will be identified in the reported data.

Methods for the determination of radionuclides and applicable MDAs will be as defined in ER-SOW-394 or as defined in the project-specific analytical laboratory Statement of Work. The laboratory will attempt to keep MDAs as low as possible, given the constraints of the sample matrix and any remote sample handling operations required to ensure the safety of laboratory personnel.

The laboratory analysts will follow the SW-846 (EPA 1996) and ER-SOW-394 methods as closely as possible to ensure the data are compliant with the requirements of the project. A smaller sample size may introduce a dilution effect, thereby elevating the detection level for a given sample or analysis. In the event that sample volume (or mass) prohibits the use of SW-846 (EPA 1996) protocols, the laboratory will make a good faith effort to assign methods that will provide acceptable, usable data and document all method deviations in the case narrative provided with the data package. Table 3-3 describes the analytical methods and detection limits for each contaminant of potential concern.

Table 3-3. Analytical methods and detection limits for each contaminant of potential concern.

Constituent	Analytical Method	Solids Detection Limits
Cesium-137	Gamma spectrometry	—[a]

a. Detection limit is indicated in the analytical method for each constituent.

3.2.3 Completeness

Completeness is the measure of the amount of valid analytical data obtained compared to the total number of data points planned. Valid analytical data are those generated when analytical systems and the resulting analytical data meet all DQA objectives outlined for the project (i.e., all calibration verification interference and other checks not affected by the sample matrix meet acceptance criteria). It is important to understand that data that are flagged during the data validation process are not necessarily invalid data. Part of the DQA process is the review of flagged data to determine whether the validation flags impact the intended use of the data. Therefore, the definition of "valid data" in the context of calculating completeness is "data that are acceptable for their intended purpose." Completeness of the reported data (expressed as a percentage) is calculated as shown in Equation (3-5).

$$C(\%) = M_v / Mt \times 100 \tag{3-5}$$

where

$C(\%)$ = completeness

M_v = number of measurements determined to be valid per analyte

Mt = total number of measurements performed per analyte.

A completeness of 90% is a common goal. All data obtained from this project should meet the quality requirements and reporting protocols unless irregularities in the matrix (a.k.a. matrix effects) impede contaminant recovery, or a broken, spilled container results in a loss of sample materials. The completeness goal for the project is to obtain enough valid data to satisfy the DQO specifications.

3.2.4 Comparability

Comparability is the degree to which one data set can be compared to another obtained from the same population using similar techniques for data gathering. Comparability will be achieved through the use of consistent sampling procedures, experienced sampling personnel, the same analytical method for like parameters, standard field and laboratory documentation, and traceable laboratory standards.

3.2.5 Representativeness

Representativeness is a measure of the degree to which data accurately and precisely represent a characteristic of a population parameter at a sampling point, a process condition, or an environmental condition. Representativeness is a qualitative term that should be evaluated to determine whether in situ and other measurements are made and physical samples are collected in such a manner that the resulting data appropriately reflect population parameter of interest in the media and phenomenon measured or studied.

3.3 Data Quality

In addition to primary project samples, QA/QC samples will be collected to establish the quantitative and qualitative criteria necessary to support the remedial action decision process and to describe the acceptability of the data by providing information both comparable to and representative of actual field conditions. To determine field accuracy, QA/QC samples consisting of field blanks and equipment rinsate blanks will be used. Quality control (duplicate) samples will be used to measure field and laboratory precision. The QA/QC sample results will be evaluated as outlined in the QAPjP (DOE-ID 2004a). Table 3-4 provides an overview of QA/QC sample analysis for this sampling effort.

3.4 Data Validation

Data will be acquired, processed, and controlled prior to input to the Integrated Environmental Data Management System (IEDMS), per ICP internal procedures. For the samples submitted to the analytical laboratory, all data will be validated to Level B, in accordance with the QAPjP (DOE-ID 2004a).

A data limitation and validation report, including copies of chain-of-custody forms, sample results, and validation flags, will be generated for each sample delivery group. All data limitation and validation reports associated with a site will be transmitted to the EPA and DEQ within 120 days from the last day of sample collection. All definitive data will be uploaded to the IEDMS.

The Sample and Analysis Management (SAM) group will ensure the data are validated to Level B, as specified. The analytical method data validation will be conducted in accordance with current ICP SAM data validation procedures. Validated data are entered into the IEDMS.

Table 3-4. Quality assurance/quality control samples.

QA/QC Sample Type	Comment
Duplicate	Field duplicates will be collected at a frequency of 1/20 samples, or 1/day/matrix, whichever is less.
Field blanks	Field blanks are only recommended for subsurface soils (>6 in.) collected for radionuclide analysis. Field blanks will be collected at a frequency of 1/20 samples, or 1/day, whichever is less.
Trip blanks	Trip blanks are only required for volatile organic analysis samples. Additionally, trip blanks are not recommended for soil samples; thus, they will not be collected.
Equipment rinsate	Equipment rinsate samples will be collected at a frequency of 1/20 samples, or 1/day/matrix, whichever is less. Equipment blanks are not required if dedicated or disposable equipment is used.

4. TECHNICAL APPROACH

Several different activities will be required to characterize the various zones of Site CPP-03. The following sections describe the approach and rationale for the characterization of CPP-03, describe activities to accomplish the characterization, and address the excavation of areas exceeding the remediation goals.

4.1 Characterization Strategy and Methods

The following section provides the strategy, rationale, and methods planned to be used to characterize the zones to the north and south of the railroad tracks.

4.1.1 Zone North of the Railroad Tracks

This zone has not been disturbed nor has soil been placed over it since it was used to store equipment. Therefore, the area north of the railroad tracks will be surveyed with field screening using an HPGe detector. The field screening will be conducted at points close enough together to provide continuous coverage over the entire zone.

4.1.2 Zone South of the Railroad Tracks

The zone south of the railroad tracks will be surveyed with field screening using an HPGe detector. The field screening will be conducted at points close enough together to provide continuous coverage over the entire area. The subsurface of the zone south of the railroad tracks will be investigated utilizing a minimum of 40 GeoProbe downhole gamma logging locations. A 40- × 40-ft grid will be established utilizing a random start point. The GeoProbe locations will be installed at the grid corners. The investigation of the subsurface in this zone will be conducted following the strategy specified in Section 4.1.2.2 through Section 4.1.2.5. If any GeoProbe installations indicate that the subsurface soils exceed the RGs, then an additional GeoProbe location will be investigated midway between the probe location exceeding the RGs and the adjacent probe locations that are below the RGs. Additional probe locations may be added in the field to further refine the extent of contamination (i.e., located between probe locations exceeding the RGs and probe locations less than the RGs). This additional data point will assist in determining the extent of each contamination area.

The list below summarizes the investigation method steps:

1. Field screening using an HPGe detector
2. Install gamma probes to 3 ft below land surface on a 40- × 40-ft grid
3. Gamma log the probes with an AMP-50 Geiger-Mueller tube-based low-range monitor
4. Collect 16 samples at random from gamma probe locations
5. Collect two samples at random from gamma probe locations with highest 10% of activity
6. Collect two samples at random from gamma probe locations with lowest 10% of activity
7. Gamma-scan the 20 samples and develop a calibration curve for the downhole gamma survey
8. Identify any areas and depths that exceed the RG of 23 pCi/g

9. At any gamma probe location that exceeds the RGs, step out 1/2 way to each of the next probes that meet RGs and install and log an additional probe

10. Collect eight gamma samples for laboratory analysis from randomly selected probe locations that meet the RGs to verify the validity of the method.

The following discussion provides more detail on the field screening and physical sampling methods planned to be used to characterize this zone.

4.1.2.1 Field Screening. Field screening will be used to provide a baseline of the surficial contamination in this area and identify areas that exceed RGs.

4.1.2.2 Probe Casings for Gamma Logging. A GeoProbe or equivalent percussion hammer/direct push drill rig will be used to install closed-bottomed, steel casing in the soils of Site CPP-03. A probe rod with 2.125 in. outside diameter (1.5 in. inside diameter) will be advanced to a depth of 3 ft bgs to provide an uncontaminated conduit for downhole gamma logging. The GeoProbe and associated equipment and drill rod are a commercial unit conforming to ICP commercial-grade quality requirements. Necessary equipment and parts (i.e., probe casing, drive rod, drive caps, and cutting shoes) will be acquired for the project. ICP Radiological Control personnel will be responsible for determination of re-use or disposal of each piece of equipment based on contamination concerns.

4.1.2.3 Downhole Gamma Logging. Gamma logging will be performed within the probe casings that will be installed by the GeoProbe rig. The gamma logging will be used to identify the vertical distribution of radionuclide contaminants within Site CPP-03. Once all probe locations have been logged, the logging information will be used to evaluate the radionuclide activity levels based on depth and assist in identifying areas in which additional samples may be required or areas that may exceed the RGs for Cs-137.

An AMP-50 radiation monitor will be used to measure the downhole radiation field at a depth of 0.5 ft (0.15 m), 1.0 (0.3 m), 2.0 (0.61 m), and 3.0 (0.91 m) ft bgs. The AMP-50 is a Geiger-Mueller tube-based low-range area monitor. The monitor has been designed specifically to be used in low-dose-rate fields using a sensitive Geiger-Mueller tube. The AMP-50's detector features a linear response from 10 μR/h to 4 R/h (0.1 μSv/h to 40 mSv/h). The instrument is 1 in. in diameter and in standard configuration comes equipped with a 25-ft-long cord.

The gamma logging results will be correlated to Cs-137 concentrations in the soil by comparing downhole gamma logging results with 20 actual sample results for Cs-137 taken from the probe locations. A regression analysis will be conducted to determine an equation correlating the two measurement methods. A simple linear regression will first be tested of goodness of fit, and nonlinear relationships will be tested if the linear regression is inadequate.

4.1.2.4 Correlation Curve Sampling. Physical samples will be collected from specific depths within a minimum of 16 of the gamma probe locations (including one set of duplicates). A random number generator will be used to determine the sample locations and depths for sample collection. An additional four samples will be collected from random locations that exhibited higher and lower downhole gamma radiation levels (from the upper 10% and lower 10% activity populations). These additional higher and lower levels will be collected to ensure that the calibration curve has sufficient end points to form a complete calibration curve. The 20 physical samples will be submitted for gamma spectroscopy to determine the amount of Cs-137 concentrations measured in pCi/g. This Cs-137 concentration data will be used to correlate the downhole gamma readings to concentration levels as described in Section 4.1.2.3.

4.1.2.5 Analytical Samples. A minimum of eight samples will be collected from random locations during the investigation phase and sent to an analytical laboratory for Cs-137 analysis. These samples will be validated to a Level B validation level. The sample data may be used to verify that non-excavated soils meet the RGs. The combination of these 8 samples and the 20 samples collected for Section 4.1.2.4 is sufficient to meet the requirements of the sample numbers needed to meet the "gray area" characterization requirements of Section 3.1.7.

4.2 Excavation of Areas Exceeding Remediation Goals

This section describes the remediation process for zones with residual concentrations of Cs-137 that require excavation.

4.2.1 Zone North of the Railroad Tracks

Excavation of surface soils will be planned for any area found through the field screening to exceed the RGs. Field screening using an HPGe detector will be conducted after the excavation is completed to determine if the remaining soil meets the RGs. The excavation will be continued to a maximum depth of 10 ft if contamination above the RGs is identified with the field survey.

4.2.2 Zone South of the Railroad Tracks

Remedial excavation will be conducted on specific areas exceeding the RGs based on the probe data and physical sampling. Any required excavation will extend to a sufficient depth to remove the soils exceeding the RGs. The excavations will extend laterally to the nearest probe location that is below the RGs. Field screening using an HPGe detector will be conducted after the excavation is completed to determine if the remaining soil meets the RGs. The excavation will be continued to a maximum depth of 10 ft if contamination above the RGs is identified with the field survey.

4.3 Confirmation Samples

Confirmation samples will be collected from any excavations in accordance with DOE-ID (2004b). A sample location will be selected in each excavation site based on the highest field screening gamma level. A minimum of one sample per excavation or eight samples total, whichever is greater, will be collected. If fewer than eight locations are excavated (eight total samples from areas excavated), then the additional sample points will be randomly located within the excavation areas. Samples will not be collected from the nonremediated areas during the confirmation sampling phase.

4.4 Random Sampling Selection

The zone south of the railroad tracks will be sampled using a 40- × 40-ft grid that is established using a random start point within the CPP-03 site. Based on the starting point, the grid system is anticipated to be three rows of probe locations, with each row having 12 to 13 points (or 40- × 40-ft grids). The points will be numbered sequentially from west to east starting with the north row. Section 4.4.1 and Figure 4-1 describe and depict this grid system.

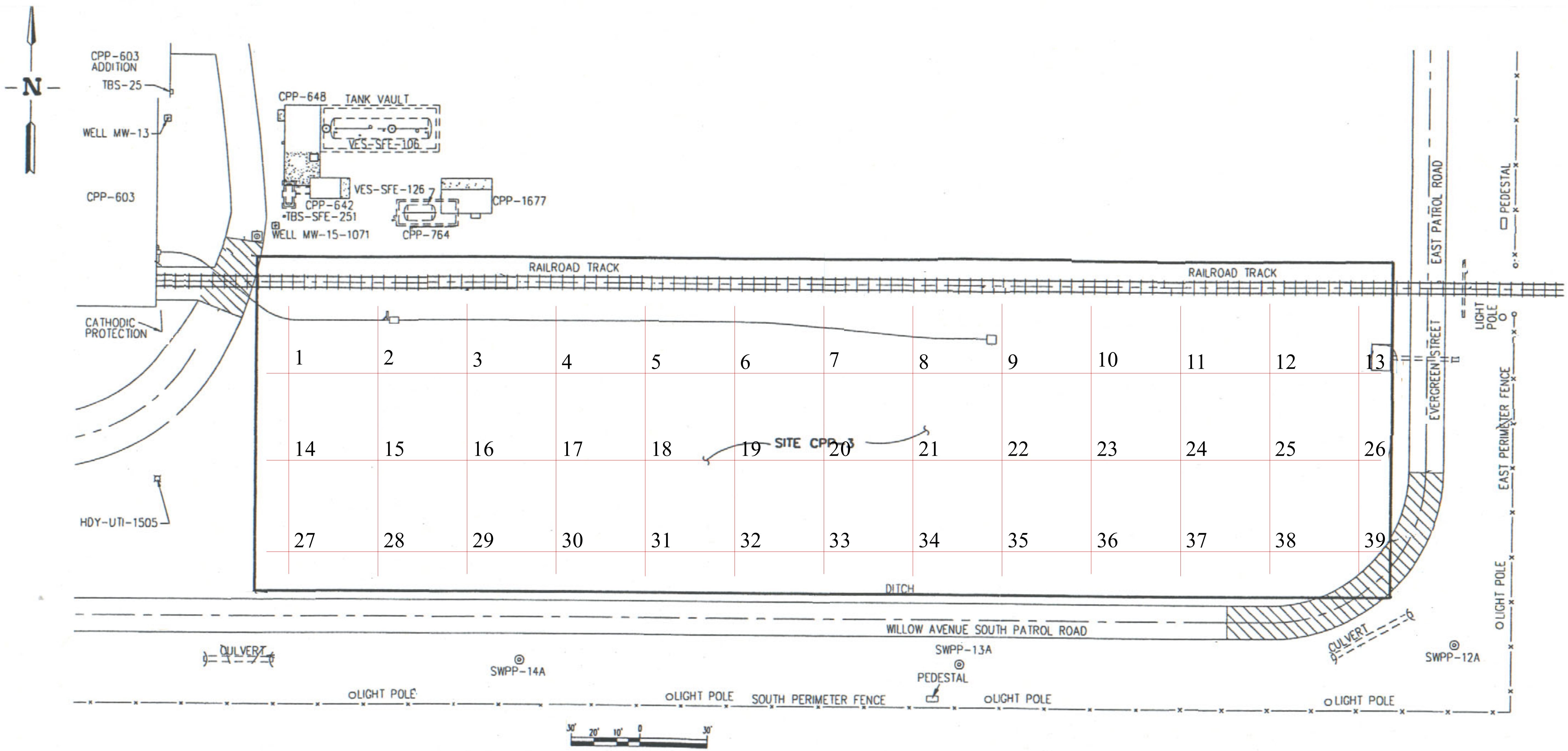


Figure 4-1. Location of sample points (at grid intersections).

4.4.1 Calibration Curve Sampling

A random number generator was used to generate a series of 16 numbers between 1 and 40 to select the 16 probe locations for calibration curve sampling. An additional random series was used to select the depth of sampling at each of the selected locations. The randomly generated sample locations and depths are shown in Table 4-1. The selection of four calibration curve sample locations within the upper 10% and lower 10% activity levels will be made with a similar method once the activity levels are measured and recorded.

Table 4-1. Random sample locations for the calibration curve sampling.

Probe Location	Depth
33	2 ft
7	½ ft
36	3 ft
12	2 ft
17	2 ft
9	1 ft
19	½ ft
10	1 ft
5	½ ft
29	3 ft
3	½ ft
30	1 ft
16	2 ft
39	½ ft
11	½ ft
28	2 ft

4.4.2 Confirmation Sampling

4.4.2.1 Areas Meeting the RGs. The selection of the eight confirmation sample locations in the zones meeting the RGs will be made using the same grid system. A random number generator will be used to select eight points from the points that meet the RGs.

4.4.2.2 Excavations. A similar random selection method will be used to select the eight confirmation sampling locations specified in the RD/RA Work Plan (DOE-ID 2004b). The locations will be chosen with consideration of the constraints of Section 4.3.

5. SAMPLING PROCESS DESIGN

Specific procedures are required to handle the samples collected during sampling activities to ensure that the data are representative of the soil. This section outlines the specific sampling process design for this activity. The sampling requirements discussed here will guide the collection of representative samples as specified in the DQOs (Section 3.1 of this plan). Procedures for sample collection are provided as guidelines for the field sampling team.

5.1 Presampling Meeting

Sampling procedures will be discussed each day in a presampling meeting. The meeting discussion will include, but is not limited to, sampling activities for the day, responsibilities of team members, health and safety issues, and waste management. Any deviations from the sampling strategy presented in this FSP will be documented in the field sampling logbook.

5.2 Sample Collection

Soil samples will be collected in accordance with ICP sampling and analysis procedures. A grid will be established and sampling locations determined as specified in Sections 4.1.2.4 and 4.4 of this plan.

Prior to being sampled, all sample locations will be located, staked, and clearly marked with the appropriate designations. Staked sampling locations will be surveyed to establish horizontal (northing and easting coordinates) and vertical (elevation referenced to mean sea level) control. Permanent benchmarks will be used to reference the vertical control data and the horizontal grid coordinates.

In addition to the systematic random sampling, samples may be collected wherever radiological screening identifies high areas of contamination above background levels. If ALs for health and safety concerns are sustained in the breathing zones, field personnel will be required to wear appropriate personal protective equipment (PPE) as determined by health and safety personnel.

An equipment rinsate will be collected from the sampling equipment that was used to collect the particular sample (e.g., hand auger, core barrel, stainless steel spoon) as required by the QAPjP (DOE-ID 2004a). The field team members will use field guidance forms from ICP SAM to ensure the proper jars and preservatives are used for each analysis type.

Table 5-1 of this FSP identifies the container volumes, types, holding times, and preservative requirements that apply to all soil and liquid samples being collected under this FSP. Following collection, the date and time of collection, as well as the sampler's initials, will be recorded on the sample label with a waterproof black marker and then covered with clear tape. The samples will be placed in coolers with Blue Ice (if required) while awaiting preparation and shipment to the appropriate laboratory. Samples will be prepared and packaged in accordance with ICP chain-of-custody and sample labeling procedures.

5.2.1 Field Radiological Control Screening

Field screening (with HPGe detectors) will be used during the sampling event for real-time characterization onsite to minimize sampling costs and provide faster results. Samples collected for remedial action objective confirmation will be sent for laboratory analyses but may also require field HPGe detectors.

Table 5-1. Sampling bottles, preservation types, and holding times.

Analysis	Volume and Type	Preservative	Holding Time
Mercury and chromium	Glass or plastic	$4^{o}C$	180 days for all metals except mercury which is 28 days
Alpha radionuclides (Am-241, Pu-238, Pu-239/240, uranium, Np-237)	High-density polyethylene (HDPE)	NA[a]	180 days for all isotopes
Beta radionuclides (Pu-241, Sr-90, H-3, I-129, Tc-99)	HDPE	NA	180 days for all isotopes except I-129 which is 28 days
Gamma emitters (Cs-137, Eu-152, Eu-154)	HDPE	NA	180 days for all isotopes

a. NA = not applicable.

Field screening using HPGe detectors for gamma radiation also will be performed prior to the initiation of sampling activities. Background radiation ranges will be obtained by measuring the naturally occurring radiation of uncontaminated soils in areas upwind of the sampling areas. The use of radiological screening instrumentation will be performed as determined by the health and safety officer, radiological engineer, and the RCT. Radiological contaminants will be identified when surface screening indicates a reading greater than the values specified in ICP radiological release surveys and control/movement of contaminated materials preestablished limits.

Using appropriate equipment, the project RCT will survey all samples obtained from this area for external contamination. The result will be documented on the sample label and the chain-of-custody form (discussed in Section 6). Requirements for release of materials from the Group 3, Other Surface Soils, sites will be documented in the project radiological work permit.

5.3 Personal Protective Equipment

The PPE required for this sampling effort is discussed in the project Health and Safety Plan (HASP) (INEEL 2004) and may include, but is not limited to, gloves, respirator cartridges, shoe covers, and coveralls.

5.4 Shipping Screening

Prior to releasing samples collected from radiologically contaminated areas of the site, the RCT will field screen all such samples to determine whether they meet the release criteria for unrestricted use. Samples that do not meet these criteria will be submitted to the Radiation Measurements Laboratory at the Test Reactor Area for a 20-minute gamma spectrometric analysis to determine the concentration of radionuclides present and the hazardous material classification for shipping purposes. Shipping screening could be onsite using HPGe, if it is acceptable to the hazardous materials shipper and current ICP policy. All samples will be shipped to the laboratories by a company-certified hazardous materials shipper in accordance with U.S. Department of Transportation (DOT) regulations and current ICP policy.

5.5 Field Decontamination

Field decontamination procedures are designed to prevent cross-contamination between locations and samples and prevent off-Site contaminant migration. All equipment associated with sampling (e.g., drilling equipment, spoons) will be thoroughly decontaminated prior to daily activities and between sample locations, in accordance with ICP sample equipment decontamination procedures. Following decontamination, sampling equipment will be wrapped in foil to prevent contamination from windblown dust.

5.6 Sampling Waste Handling and Disposition

Waste streams generated as a result of sampling activities may include (but not be limited to) PPE, sample supplies and equipment, decontamination water (which may be used in small quantities during sampling), and excess or spent samples. All waste streams that are generated as a result of the sampling activities will be containerized, maintained, and disposed of in accordance with the project Waste Management Plan (DOE-ID 2004d).

6. SAMPLING DESIGNATION

Samples collected will be identified with a unique code and arranged in a SAP table and database. Specific SAP tables will be prepared prior to each sampling event. In an effort to minimize SAP discrepancies, SAP tables will be prepared immediately before each sampling event, and the completed SAP tables will be included in the data summary report for each excavation site. The OU 3-13, Group 3, project manager is responsible for SAP table accuracy.

6.1 Sample Identification Code

A systematic character identification (ID) code will be used to uniquely identify all samples. Uniqueness is required to maintain consistency and prevent the same ID code from being assigned to more than one sample.

The first designator of the code, 3, refers to the sample originating from WAG 3. The second and third designators, RA, refer to the sample being collected in support of the remedial action. The next three numbers designate the sequential sample number for the project. Regular and field duplicate samples will be designated with a two-character set (i.e., 01, 02). The last two characters refer to a particular analysis and bottle type.

For example, a soil sample collected in support of the remedial action might be designated as 3RA00101R4, where (from left to right):

- **3** designates the sample as originating from WAG 3.
- **RA** designates the sample as being collected for the remedial action.
- **001** designates the sequential sample number.
- **01** designates the type of sample (01 = regular, 02 = field duplicate).
- **R4** designates gamma spectrometric analysis.

The IEDMS database will be used to record all pertinent information associated with each sample identification code. Preparation of the plan database and completion of the SAM request for services are used to initiate the sample and sample waste tracking activities performed by the SAM.

6.2 Sampling and Analysis Plan Table/Database

6.2.1 General

A SAP table format was developed to simplify the presentation of the sampling scheme for project personnel. The following sections describe the information that will be recorded in the SAP tables.

6.2.2 Sample Description Fields

The sample description fields contain information relating to individual sample characteristics.

6.2.2.1 Sampling Activity. The sampling activity field contains the first six characters of the assigned sample number. The sample number in its entirety will be used to link information from other sources (field data, analytical data, etc.) to the information in the SAP tables for data reporting, sample tracking, and completeness reporting. The analytical laboratory will also use the sample number to track and report analytical results.

6.2.2.2 Sample Type. Data in this field will be selected from the following:

- REG for a regular sample
- QC for a QC sample.

6.2.2.3 Matrix. Data in this field will be selected from the following:

- Soil for soil samples
- Water for QA/QC samples.

6.2.2.4 Collection Type. Data in this field will be selected from the following:

- GRAB for grab
- COMP for composite
- FBLK for field blanks
- RNST for rinsates
- DUP for duplicate samples.

6.2.2.5 Planned Date. This date is related to the planned sample collection start date.

6.2.3 Sample Location Fields

This group of fields pinpoints the exact location for the sample in three-dimensional space, starting with the general AREA, narrowing the focus to an exact location geographically, and then specifying the DEPTH in the depth field.

6.2.3.1 Area. The AREA field identifies the general sample-collection area. The field should contain the standard identifier from the INL Site area being sampled. For this investigation, samples are being collected from INTEC.

6.2.3.2 Location. This LOCATION field may contain geographical coordinates, x-y coordinates, building numbers, or other location-identifying details, as well as program-specific information, such as a borehole or well number. Data in this field will normally be subordinated to the AREA. Samples will be collected from the INTEC area. The LOCATION field identifier will correspond to this site.

6.2.3.3 Type of Location. The TYPE OF LOCATION field supplies descriptive information concerning the exact sample location. Information in this field may overlap that in the LOCATION field, but it is intended to add detail to the location (e.g., native soil).

6.2.3.4 Depth. The DEPTH of a sample location is the distance in feet from surface level or a range in feet from the surface.

6.2.4 Analysis Type

6.2.4.1 Analysis Type 1 through 20. The ANALYSIS TYPE (AT) fields indicate analytical types (radiological, chemical, hydrological, etc.). Space necessary to clearly identify each type is provided at the bottom of the form. A standard abbreviation should also be provided, if possible.

7. DOCUMENTATION MANAGEMENT AND SAMPLE CONTROL

The following discussions summarize document management and sample control requirements, as well as sample equipment and handling.

7.1 Documentation

The field team leader (FTL) will be responsible for controlling and maintaining all field documents and records and for ensuring that all required documents will be submitted to the ICP Administrative Records and Document Control Office at the conclusion of the project.

Sample documentation, shipping, and custody procedures for this project are based on EPA-recommended procedures that emphasize careful documentation of sample collection and sample transfer. The appropriate information pertaining to each sample will be recorded in accordance with ICP logbook practices and chain-of-custody procedures and the QAPjP (DOE-ID 2004a). All personnel involved with handling, managing, or disposing of samples will be familiar with ICP handling and shipping sample procedures, and all samples will be dispositioned accordingly.

A Document Action Request is required when field conditions dictate making any changes to this FSP, the project HASP, or other controlled project procedures (e.g., requiring additional analyses to meet appropriate Waste Acceptance Criteria). If necessary, a Document Action Request will be executed in accordance with ICP document procedures.

All information recorded on project field documentation (e.g., logbooks, chain-of-custody forms) will be made in permanent ink. All field documentation errors will be corrected by drawing a single line through the error and entering the correct information; all corrections will be initialed and dated. In addition, photographs will be taken to document the field sampling activities.

7.1.1 Sample Container Labels

Waterproof, gummed labels generated from the IEDMS database will display information such as the sample ID number, the name of the project, sample location, depth, and requested analysis type. In the field, label information will be completed and placed on the containers before samples are collected. Information concerning sample date, time, preservative used, field measurements of hazards, and the sampler's initials will be recorded during field sampling.

7.1.2 Field Guidance Forms

Field guidance forms, provided for each sample location, will be generated from the IEDMS database to ensure unique sample numbers. Used to facilitate sample container documentation and organization of field activities, these forms contain information regarding the following:

- Media
- Sample identification numbers
- Sample location
- Aliquot identification
- Analysis type
- Container size and type

- Sample preservation methods
- Field logbooks.

In accordance with the Administrative Records and Document Control format, field logbooks will be used to record information necessary to interpret the analytical data. All field logbooks will be controlled and managed according to ICP procedures. The FTL, or designee, will ensure by periodic inspection that the field logbooks are being maintained accordingly. The field logbooks will be submitted to the project files at the completion of field activities.

7.1.2.1 Sample Logbooks. Sample logbooks used by the field teams will contain such information as the following:

- Physical measurements (if applicable)
- Pertinent information for all QA/QC samples
- Shipping information (e.g., collection dates, shipping dates, cooler ID number, destination, chain-of-custody number, name of shipper).

7.1.2.2 Field Team Leader's Daily Logbook. A project logbook maintained by the FTL will contain a daily summary of the following:

- All team activities
- Problems encountered
- Visitors
- List of work site contacts
- Signature and date, which is entered by the FTL or designee at the end of each day's sampling activities.

7.2 Sample Equipment and Handling

Analytical samples for laboratory analyses will be collected in precleaned bottles and packaged according to American Society for Testing and Materials or EPA-recommended procedures. The QA/QC samples will be included to satisfy the QA/QC requirements for the field operation as outlined in the QAPjP (DOE-ID 2004a). Qualified analytical and testing laboratories (approved by SAM) will analyze these samples.

7.2.1 Sample Equipment

Included below is a tentative list of necessary equipment and supplies. This list is as extensive as possible, but not exhaustive, and should only be used as a guide. Other equipment and supplies given in the project-specific HASP are not included in this section. Sampling equipment that would come into contact with sample material will be cleaned prior to use, using an appropriate method (e.g., Alconox or similar nonphosphate soap with deionized water rinse, or equivalent). Field sampling and decontamination supplies may include the following:

- Stainless steel hand augers
- Direct-push drill rig

- Tape measure (30.5 m [100 ft])
- Wood stakes and ribbon (30.5 m [100 ft])
- Stainless steel spoons
- Stainless steel or aluminum composting pans
- Paper wipes
- Plastic garbage bags
- Deionized water (20 L [5.3 gal] minimum)
- Nonphosphate-based soap
- Spray bottles
- Aluminum foil
- Pipe wrench
- Crescent wrench
- Hammer
- Tables
- Certified ultrapure water (5 L [1.3 gal] JT Baker)
- Sample and shipping logbook
- FTL logbook
- Controlled copies of the FSP, QAPjP, HASP, and applicable referenced procedures
- Black ink pens
- Black ultrafine markers
- Sample containers, as specified in the QAPjP
- Preprinted sample labels and field guidance forms
- Nitrile or latex gloves
- Leather work gloves
- Ziploc plastic bags
- Custody seals.

Sample preparation and shipping supplies include the following:

- Pipettes
- pH paper
- Nitrile or latex gloves
- Paper wipes
- Parafilm
- Clear tape

- Strapping tape
- Resealable plastic bags (such as Ziploc) in various sizes
- Chain-of-custody forms
- Shipping request forms
- Names, addresses, telephone numbers, and contact names for analytical laboratories
- Task Order Statements of Work for analytical laboratories and associated purchase order numbers
- Vermiculite or bubble-wrap (packaging material)
- Plastic garbage bags
- Blue Ice
- Coolers
- "This Side Up" and "Fragile" labels
- Address labels
- Sample bottles and lids
- Custody seals.

7.2.2 Sample Containers

Table 5-1 identifies container volumes, types, holding times, and preservative requirements that apply to all soil and liquid samples being collected under this FSP. All containers will be precleaned (typically certified by the manufacturer) using the appropriate EPA-recommended cleaning protocols for the bottle type and sample analyses. Extra containers will be available in case of breakage or contamination or if the need for additional samples arises. Prior to use, preprinted labels with the name of the project, sample identification number, location, depth, and requested analysis will be affixed to the sample containers.

7.2.3 Sample Preservation

Water samples will be preserved in a manner consistent with the QAPjP (DOE-ID 2004a). If cooling is required for preservation, the temperature will be checked periodically prior to shipment to certify adequate preservation for those samples that require temperatures of 4° C (39° F) for preservation. Ice chests (coolers) containing frozen reusable ice will be used to chill samples in the field after sample collection, if required.

7.2.4 Chain of Custody

The ICP chain-of-custody procedures will be followed as well as the requirements in the QAPjP (DOE-ID 2004a). Sample bottles will be stored in a secured area accessible only to the field team members.

7.2.5 Transportation of Samples

Samples will be shipped in accordance with the regulations issued by DOT (49 CFR 171 through 178) and EPA sample handling, packaging, and shipping methods (40 CFR 262.11). All samples will be packaged in accordance with ICP chain-of-custody and sample labeling procedures.

7.2.5.1 Custody Seals.

7.2.5.1 Custody Seals. Custody seals will be placed on all shipping containers to ensure that tampering or unauthorized opening will not compromise sample integrity. The seal will be attached in such a way that opening the container requires the seal to be broken. Clear plastic tape will be placed over the seals to ensure that the seals are not damaged during shipment. Seals will be affixed to containers before the samples leave the custody of the sampling personnel.

7.2.5.2 On-Site and Off-Site Shipping. An on-Site shipment is any transfer of material within the perimeter of the INL Site. Site-specific requirements for transporting samples within Site boundaries and those required by the shipping/receiving department will be followed. Shipment within the INL Site boundaries will conform to DOT requirements as stated in 49 CFR 171 through 49 CFR 178. Off-Site sample shipments will be coordinated with ICP Packaging and Transportation personnel, as necessary, and will conform to all applicable DOT requirements.

7.2.5.3 Sample Movement within INTEC. Sample movement within the INTEC facility will comply with all company procedures and policies governing the movement of radioactive materials within the facility perimeter.

7.3 Documentation Revision Requests

Revisions to this document will follow ICP document procedures.

8. PROJECT ORGANIZATION AND RESPONSIBILITIES

The organizational structure is shown in Section 9 of the HASP (INEEL 2004).

9. REFERENCES

40 CFR 136, Appendix B, 2003, "Definition and Procedure for the Determination of the Method Detection Limit—Revision 1.11," *Code of Federal Regulations*, Office of the Federal Register, September 2003.

40 CFR 262.11, 2005, "Hazardous waste determination," *Code of Federal Regulations*, Office of the Federal Register, June 2005.

49 CFR 171, 2004, "General Information, Regulations, and Definitions," *Code of Federal Regulations,* Office of the Federal Register, October 2004.

49 CFR 172, 2004, "Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements," *Code of Federal Regulations*, Office of the Federal Register, October 2004.

49 CFR 173, 2004, "Shippers—General Requirements for Shipments and Packagings," *Code of Federal Regulations*, Office of the Federal Register, October 2004.

49 CFR 174, 2004, "Carriage by Rail," *Code of Federal Regulations*, Office of the Federal Register, January 2004.

49 CFR 175, 2004, "Carriage by Aircraft," *Code of Federal Regulations*, Office of the Federal Register, October 2004.

49 CFR 176, 2004, "Carriage by Vessel," *Code of Federal Regulations*, Office of the Federal Register, October 2004.

49 CFR 177, 2004, "Carriage by Public Highway," *Code of Federal Regulations*, Office of the Federal Register, October 2004.

49 CFR 178, 2004, "Specifications for Packagings," *Code of Federal Regulations*, Office of the Federal Register, October 2004.

Conover, W. J., 1980, *Practical Nonparametric Statistics,* New York: John Wiley & Sons, Inc.

DOE-ID, 1991, *Federal Facility Agreement and Consent Order for the Idaho National Engineering Laboratory,* Administrative Record No. 1088-06-29-120, U.S. Department of Energy Idaho Operations Office; U.S. Environmental Protection Agency, Region 10; Idaho Department of Health and Welfare, December 4, 1991.

DOE-ID, 1999, *Final Record of Decision, Idaho Nuclear Technology and Engineering Center, Operable Unit 3-13,* DOE/ID-10660, Rev. 0, U.S. Department of Energy Idaho Operations Office, October 1999.

DOE-ID, 2004a*, Quality Assurance Project Plan for Waste Area Groups 1, 2, 3, 4, 5, 6, 7, 10 and Deactivation, Decontamination, and Decommissioning*, DOE/ID-10587, Rev. 8, U.S. Department of Energy Idaho Operations Office, March 2004.

DOE-ID, 2004b, *Operable Unit 3-13, Group 3, Other Surface Soils Remediation Sets 1–3 (Phase I) Remedial Design/Remedial Action Work Plan*, DOE/ID-11089, Rev. 0, U.S. Department of Energy Idaho Operations Office, February 2004.

DOE-ID, 2004c, *Operable Unit 3-13, Group 3, Other Surface Soils Remediation Sets 1-3 (Phase I) Field Sampling Plan*, DOE/ID-11091, Rev. 0, U.S. Department of Energy Idaho Operations Office, February 2004.

DOE-ID, 2004d, *Operable Unit 3-13, Group 3, Other Surface Soils Remediation Sets 1–3 (Phase I) Waste Management Plan*, DOE/ID-11092, Rev. 0, U.S. Department of Energy Idaho Operations Office, January 2004.

EPA, 1988, *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final*, EPA/540/G-89/004, U.S. Environmental Protection Agency, October 1988.

EPA, 1989, *Methods for Evaluating the Attainment of Cleanup Standards, Volume I: Soils and Solid Media*, EPA/230/02-89/042, U.S. Environmental Protection Agency, February 1989.

EPA, 1996, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, U.S. Environmental Protection Agency, 1996.

EPA, 2000, *Data Quality Objective Process for Hazardous Waste Site Investigations,* EPA QA/G-4HW, EPA/600/R-00/007, U.S. Environmental Protection Agency, January 2000.

ER-SOW-394, 2005, "Sample and Analysis Management Statement of Work for Analytical Services," Rev. 3, Idaho National Engineering and Environmental Laboratory, March 2005.

Golder, 1990, *Report for the Idaho Chemical Processing Plant Drilling and Sampling Program at Land Disposal Unit CPP-34*, 893-1195.032, Ref: C86-151159, Task 6, Golder Associates, June 1990.

INEEL, 2004, *Operable Unit 3-13, Group 3, Other Surface Soils Remediation Sets 1–3 (Phase I) Health and Safety Plan*, INEEL/EXT-03-00628, Rev. 0, Idaho National Engineering and Environmental Laboratory, January 2004.

INEL, 1996, *Background Dose Equivalent Rates and Surficial Soil Metal and Radionuclide Concentrations for the Idaho National Engineering Laboratory*, INEL-94/0250, Rev. 1, Idaho National Engineering and Environmental Laboratory, August 1996.

LITCO, 1995, *Final Preliminary Scoping Track 2 Summary Report for Operable Unit 3-09*, INEL-95/0094, Rev. 4, Lockheed Idaho Technology Company, February 1995.

Rood, S. M., G. A. Harris, and G. J. White, 1995, *Background Dose Equivalent Rates and Surficial Soil Metal and Radionuclide Concentrations for the Idaho National Engineering Laboratory*, INEL-94/0250, Rev. 0, Idaho National Engineering Laboratory, February 1995.

WINCO, 1993, *Sampling and Analysis Plan for Track 2 Characterization of Idaho Chemical Processing Plant, Operable Unit 3-09*, Rev. 1, WINCO Environmental Restoration, Idaho National Engineering Laboratory, December 1993.